Pine Mountain Late-Successional Reserve
Habitat Protection and Enhancement Project

Fisheries Biological Assessment (BA)

Upper Lake Ranger District, Mendocino National Forest

Project Location:

Lake County, California

Township 17 North, Range 10 West, Sections 2-5 and 8-10

Township 17 North, Range 11 West, Section 12

Township 18 North, Range 10 West, Sections 20, 25-29, 32-35

Township 18 North, Range 11 West, Sections 24, 25, 35 and 36

Prepared by: Derrick B. Bawdon, District Fisheries Biologist

Upper Lake/Covelo Ranger Districts, Mendocino National Forest

Date: 07/16/2016

Summary of Determinations

Species/Habitat	Status	Determination
SONCC Coho salmon ESU*Oncorhynchus kisutch (Walbaum)*	T	MANLAA
SONCC Coho salmon ESU Critical Habitat	XP	MANLAA
CC Chinook salmon ESU *Oncorhynchus tshawytscha* (Walbaum)	T	MANLAA
CC Chinook salmon ESU Critical Habitat	XP	No Effect
NC Steelhead trout*Oncorhynchus mykiss* (Walbaum)	T	MANLAA
NC Steelhead trout Critical Habitat	XP	No Effect

T=Threatened, S=Sensitive, XP=Proposed Critical Habitat

Contact: Derrick B. Bawdon, Phone: (707)275-1429 e-mail: dbawdon@fs.fed.us

I. Introduction:

The purpose of this biological assessment (BA) is to determine the effects of the implementation of the Pine Mountain Late-Successional Reserve Habitat Protection and Enhancement Project on endangered, threatened, proposed, candidate species and their critical habitat, as listed by the National Marine Fisheries Service (NMFS). This analysis was prepared in accordance with Forest Service Manual (FSM 2670) direction and the Endangered Species Act (as amended).

The project is located on the Upper Lake Ranger District within the Mendocino National Forest in Lake County, California. The project is located in portions of Township 17 North, Range 10 West, Sections 2-5 and 8-10, Township 17 North, Range 11 West, Section 12, Township 18 North, Range 10 West, Sections 20, 25-29, 32-36 and Township 18 North, Range 11 West, Sections 24, 25, 35 and 36. The project area is contained completely within the Van Arsdale Reservoir, Lake Pillsbury, Potter Valley and Elk Mountain USGS 7.5 minute quadrangle maps. Elevations in the 10,200 acre project area range between 1,548 feet and 3,971 feet.

Species listed in Table 1 were considered for analysis because they are federally listed as threatened, endangered, proposed, candidate species or had designated critical habitat.

Table 1: Endangered, Threatened, Proposed, Candidate species and their designated critical habitat in the project area.

Species/Habitat	Status	Project within species distribution range (Y/N)	Habitat in or near project area (Y/N)	Species present (Y/N)	Effects	Determination
SONCC Coho salmon ESU*Oncorhynchus kisutch (Walbaum)*	T	Y	Y	N	Indirect	MANLAA
SONCC Coho salmon ESU Critical Habitat	XP	Y	Y	N	Indirect	MANLAA
CC Chinook salmon ESU *Oncorhynchus tshawytscha* (Walbaum)	T	Y	Y	Y	Indirect	MANLAA
CC Chinook salmon ESU Critical Habitat	XP	Y	N	N	None	No Effect
NC Steelhead trout*Oncorhynchus mykiss* (Walbaum)	T	Y	Y	Y	Indirect	MANLAA
NC Steelhead trout Critical Habitat	XP	Y	N	N	None	No Effect

The project area is within the distribution range and habitat is present for the **SONCC Coho salmon, CC Chinook salmon** and the **NC Steelhead (Moyle, 2002)**; therefore, these species will be further discussed in this analysis, and the effects of proposed actions on these species.

Critical habitat for **SONCC Coho salmon** has been identified in the project area; therefore, critical habitat for SONCC Coho salmon will be considered in this analysis (NMFS, 1999).

There is no identified critical habitat for CC Chinook salmon or NC Steelhead in the project area; therefore, critical habitat for CC Chinook salmon and NC Steelhead will not be considered in this analysis (NMFS, 2000).

II. Consultation to date

A list of Endangered and Threatened species and their habitat was obtained from the Sacramento U.S. National Marine Fisheries Service office website (http://www.fws.gov/sacramento/es/spp_lists.htm) on January 18, 2016, covering the USGS 1:24,000 Lake Pillsbury quadrangle. It considers information from the National Marine Fisheries Service (NMFS) listing of species and Critical Habitat (CH) under the Endangered Species Act (ESA); consideration of Forest Service Sensitive (FSS) fish species; and past reports and surveys specific to the project area. The species identified on this list were considered in this analysis (Table 1).

III. Current Management Direction

Current management direction is based on the guidance documented in the Mendocino National Forest, Land and Resource Management Plan (LRMP), dated February, 1995 and the subsequent Record of Decision (ROD) dated July 1996. The Mendocino National Forest LRMP describes standard and guidelines that would be incorporated into the project design. Management requirements would also incorporate Best Management Practices (BMPs) relevant to this particular project, as described in the Water Quality Management for Forest System Lands in California – Best Management Practices (USDA, 2000).

On June 20, 1997, NMFS issued a Biological Opinion for the MNF Land and Resource Management plan (LRMP), and on April 16, 2001, NMFS sent a letter of response to re-initiate consultation on the LRMP. The Biological Opinion for the LRMP identified “Reasonable and prudent measures” on page 55, and terms and conditions on page 58 requiring the Forest to utilize the Level 1 team consultation process and apply the NMFS Checklist and Matrix of Pathways and Indicators (NMFS, 1996) to evaluate all proposed activities that may affect listed, proposed or candidate species of Pacific salmonids. Term and condition 2b on page 59 states: “to facilitate the ESA consultation process and ensure agreement on effects determinations, utilize the Level 1 process and apply the NMFS’ Checklist and Matrix of Pathways

and indicators (NMFS, 1996) to determine whether proposed actions are either “May Affect, Not Likely to Adversely Affect” or “May Affect, Likely to Adversely Affect” listed, proposed, or candidate species of the Pacific salmonids. The NMFS Checklist and Matrix of Pathways and Indicators were used to evaluate the effects of the proposed actions on the anadromous habitat in or near the planning area.

IV. Description of Proposed Action

Alternative 1 – No Action

Alternative 2 – Proposed Action

The following is a summary of the Proposed Action for the Pine Mountain Late-Successional Reserve Habitat Protection and Enhancement Project. A complete detailed description of the project Proposed Action can be found in Chapter two of the Environmental Impact Statement (EIS):

The Mendocino National Forest, Upper Lake Ranger District, proposes to conduct fuels reduction and habitat enhancement treatments on approximately 7,830 acres southwest of Lake Pillsbury in the Pine Mountain vicinity. The Planning Area is 10,200 acres in size and comprises both Late Successional Reserve (LSR) and Matrix land designations. Of the approximately 7,830 acres to be treated, ~5690 acres are within the Pine Mountain LSR and ~2,140 acres are in Matrix lands. The project emphasizes fuel reduction activities and habitat management for the protection and enhancement of late-successional species. The project area was chosen for treatment based on past fire history and the existing conditions that pose a threat to late-successional habitat.
The Pine Mountain LSR is one of the smaller LSRs within the Forest and provides a link between the Blue Slides LSR seven miles to the southeast and the Sanhedrin LSR, 1.25 miles to the north. This LSR also provides a critical link to State and other Federal lands to the south and west. This area is currently part of Northern Spotted Owl Critical Habitat (Unit 11, Subunit ICC 5), a designated land allocation by US Fish and Wildlife Service, and also includes 1.6 miles of critical habitat for anadromous fish. These habitats are located within both the LSR and matrix lands. The Project Area is located approximately 15 miles north of the town of Upper Lake, primarily in T18N, R10W, and portions ofT18N, Rll W; Tl7N, R10W; and Tl7N, Rll W, Mount Diablo Base Meridian. (See Map).
Treatments are being designed to accomplish the following Purpose and Need objectives:

1. Reduce the risk to late-successional habitat loss from wildfire through vegetative treatments designed to modify and restore characteristic fire regimes and forest structure.

2. Improve forest health, vigor, and resilience to fire, insects and disease as well as enhance the diversity of plant and animal habitat found within the project area while restoring and enhancing late successional habitat.

3. Manage National Forest lands (including roads and trails) to meet the Aquatic Conservation Strategy Objectives and direction set forth in the Mendocino National Forest Land and Resource Management Plan (LRMP).

The Proposed Action includes the following treatments to achieve the desired condition:

- Fuel treatments may be applied as prescribed fire only or as a combination of prescribed fire with mechanical treatments, piling and pile burning.

- Mechanical treatments will include mastication or thinning of trees. Thinning of trees less than 10 inches in diameter at breast height (dbh) will be implemented by Forest Service personnel or through service contracts. Thinning of trees greater than 10 inches dbh will be implemented through a commercial contract. These treatments are intended to achieve ecological objectives such as restoring a fire-resilient stand structure, managing for open habitat (that includes shrubs and hardwoods), hastening the development of desired late successional stand characteristics in plantations as well as accelerating the development and vigor of larger trees outside plantations. Treatments would reduce competition between trees for onsite resources such as moisture, light, nutrients and growing space; and would reduce overly dense stand conditions which have led to declining stand health and uncharacteristic fire regimes.
- Prescribed fire treatments will be applied in chaparral areas, following direction provided by the LRMP, to create a mosaic of age classes which provides for the development of heterogeneous chaparral habitat and interruption of fuel continuity.
- Prescribed fire treatment will be applied in forested areas with excessive accumulations of natural fuels, following direction provided by the LRMP.
- Shaded fuel breaks will be constructed following direction provided by LSR Assessment to provide a buffer against fires originating from the west and moving eastward with the prevailing winds. The fuel breaks will also assist in prescribed fire activities.

Other proposed activities include road management such as road maintenance, drainage improvement, road decommissioning, temporary road construction and rehabilitation, and non-system trail closures. The Interdisciplinary Team is developing design features and Best Management Practices to protect water, wildlife, aquatic, archaeological, cultural, and botanical resources. Refer to the Table of Proposed Actions below which includes the proposed treatment acreage and mileage. **Table 2: Proposed Action (Alternative 2)**

Proposed Treatments	Proposed Action
Thinning <10 in. dbh and post-thinning prescribed fire	3760 acres
Thinning > 10 in. dbh and post-thinning prescribed fire	1650 acres
Prescribed fire within chaparral areas[1]	2420 acres
Shaded fuel break construction	9 miles
Use of existing undesignated roads[2]	3.9 miles
Reconstruction of existing undesignated roads[2]	0.58 miles
New temporary road construction[2]	0.25 miles
Designate non-system road as trail	0.3 mi.
Road decommissioning	1.3 mi.
Ghost road deletion[3]	0.4 mi.
Closure of non-system trails	17.6 mi.

1Not all 2420 acres will be burned. In order to create a mosaic of age classes burning would be conducted over several years and areas would be left unburned to maintain the oldest age class.
2These roads will be decommissioned after project completion.
3 Ghost Roads are roads that do not exist on the ground, but are delineated on maps; they will be

removed from the map layers after project implementation.

A compete detailed description of the individual unit prescriptions can be found in Appendix B.

Alternative 3 – Preferred Alternative (No new temporary road construction)

Actions proposed under this alternative would be the same as the Proposed Action (Alternative 2), with the exception of the ¼ mile of new temporary road construction. The Upper Lake Ranger District Interdisciplinary Team recommended this alternative as the preferred alternative of choice.

Alternative 4 – No thinning above 10" DBH in Riparian Reserves

This alternative is proposing the same actions as the Proposed Action (Alternative 2), with the exception of "no thinning above 10" DBH in the Riparian Reserves".

Alternative 5 – No thinning above 10" DBH in known Northern Spotted Owl nesting habitat

Actions proposed under this alternative would be the same as the Proposed Action (Alternative 2), with the exception of "no thinning above 10" DBH in known Spotted Owl nesting habitat.

V. Existing Environment

The Pine Mountain Late-successional Reserve (LSR) Enhancement Project aquatic habitat can be characterized as three watersheds; Bucknell Creek, Benmore Creek and Packsaddle Creek, of which Bucknell Creek and Benmore Creek drain directly into the lower Eel River below Scott Dam. A short section (6.5 miles) of the Eel river also has the potential to be indirectly affected by project activities, the section of the Eel River between the mouth of Bucknell Creek and the mouth of Benmore Creek (see table #3). Packsaddle Creek drains into the Rice Fork arm of Lake Pillsbury above Scott dam.

The analysis area appears to contain habitat for three fish species listed under the Endangered Species Act: Southern Oregon/Northern California Coast (SONCC) coho, Northern California (NC) steelhead, and California Coastal (CC) Chinook salmon. This habitat is in Bucknell and Benmore creeks and in the affected reach of the Eel River.

The eastern portion of the project lies in the Packsaddle subwatershed of the Rice Fork 5th field watershed, which drains into Lake Pillsbury and does not contain anadromous fish. Lake Pillsbury, formed by Scott Dam, is a PG&E managed water storage facility for hydroelectric power generation about 12 miles downstream at Van Arsdale. Lake Pillsbury, Rice Fork Creek, and some Rice Fork tributaries provide habitat for resident rainbow trout. Packsaddle Creek is fishless adjacent to the

project, but is documented to contain habitat used by the non-native Sacramento pikeminnow near its confluence with Rice Fork Creek.

The western portion of the project lies within the Bucknell and Benmore subwatersheds of the Soda Creek 5th field watershed which is an anadromous watershed. Bucknell Creek and Benmore Creek which flow into the Eel River within the Soda Creek watershed provide designated critical habitat for Southern Oregon/Northern California Coast (SONCC) coho. Additionally Northern California (NC) steelhead have been documented in both of these streams, but the streams are not currently designated as critical habitat for steelhead. The Eel River also provides designated critical habitat for SONCC coho and the California Coastal (CC) Chinook salmon. Chinook carcasses and redds have been seen in the past in the lower portions of Bucknell Creek and Benmore Creek, but these tributary streams are not designated Chinook critical habitat. Coho salmon are only rare visitors to the Soda watershed, but it is possible that adult coho will stray into this watershed and spawn before the project is completed. However, while summer stream temperatures are cool enough for juvenile steelhead, they are higher than those preferred by coho for juveniles to over-summer.

The headwaters of Packsaddle Creek lie within the project boundaries and this stream is a tributary to Rice Fork. No fish have been documented in Packsaddle Creek adjacent to the project, but nonnative Sacramento pikeminnow have been found in lower Packsaddle Creek and Rice Fork upstream and downstream of the project area. There is no suitable juvenile rearing habitat for western brook lamprey in Packsaddle Creek or the adjacent Rice Fork due to the high stream gradient and insufficient instream fines.

The Eel River below Lake Pillsbury contains the Asian clam (*Corbiculaflumenia*) which is a nonnative aquatic invasive species.

Habitat overview:

Table #3: Habitat length by species in project area.

Stream Name	Total Perennial Habitat Length in project area	Anadromous Habitat	Resident habitat	FYLF habitat	WPT Habitat	Intermittent & ephemeral Tributary Habitat
Benmore Creek	3.99 miles	2.50 miles	2.83 miles	3.25 miles	2.00 miles	8.59 miles
Bucknell Creek	5.62 miles	4.50 miles	5.62 miles	3.50 miles	1.50 miles	7.80 miles
Packsaddle Creek	17.75 miles	None	3.74 miles	3.00 miles	2.00 miles	5.24 miles
Eel River	6.50 miles	6.50 miles	6.50 miles	6.50 miles	6.50 miles	None effected by project activities
Totals	33.86 miles	13.50 miles	18.69 miles	16.25 miles	12.00 miles	21.63 miles

Benmore Creek:
Benmore Creek is a second order stream with its mouth located at T18N, R10W, S21 on the Eel River. Benmore Creek was surveyed by California Department of Fish and Game in 1998 from the mouth to the end of fish habitat for a total distance of 14,950 feet (2.83 miles). A short section 328 feet (0.06 miles) of the mid-section of Benmore Creek was again surveyed in 2014 by the Upper Lake Ranger District Hydrologist. The results of the two known surveys of channel conditions of Benmore Creek are summarized below:

Benmore Creek is dominated by two distinct Rosgen channel types, A4 (3,460 feet) and B4 (11,348 feet) channel types, which are both dominated by gravel substrate with a lesser amount of cobble and boulders with some fine sediment present. The A4 channel type is characterized by a relatively steep gradient (>10% gradient) usually located in a confined canyon with a low sinuosity rating (<1.2). The B4 channel type is characterized by a moderate slope (2-4% gradient) usually located in a moderately narrow canyon with a moderate sinuosity (>1.2). The suitability of these channel types for fish habitat improvement structures is excellent in the B4 channel type and good in the A4 channel types, which makes this stream a good candidate for future fish habitat improvement projects designed to increase pool habitat and spawning gravels.

Benmore Creek meets the Eel River on a large alluvial floodplain which reduces the gradient of the stream to <1%. The low gradient in this area reduces stream flows and allows substrate to fall out of the water column and accumulate at the mouth of the creek. The high amount of aggregate at the mouth of the stream causes the flow to become sub-surface and prevents access to the stream by anadromous fish at certain times of the year (low flow). Access to the stream is limited for summer steelhead and late season spring Chinook during most years. Access to Benmore creek is dependent on the influx of water from large or sustained storm events and snow melt.

The surveys showed that the stream is comprised of less than half (47%) slow water habitats, with only 11% being pools >2.5 feet in depth. The remainder of the stream (53%) is characterized as fast water or riffles, runs, glides and special habitat units (chutes, cascades and waterfalls). Generally when pool habitat makes up less than 40% of the total length of the stream, pool habitat enhancement projects should be considered.

In small confined channel types the suitable spawning habitat is usually located at the pool tail-out, which is where gravel accumulates because of the reduced flow at this location. Fine sediment accumulations cause the gravel to become embedded and unusable for spawning. The higher the embeddedness rating the less usable the gravel becomes for salmonid spawning. An embeddedness rating of 1 indicates excellent spawning habitat, and an embeddedness rating of 5 are considered unsuitable for spawning. Excellent spawning habitat was located in only 6% of the pool habitat and 25% of the pool habitat was rated as good for a total of 31% of pool habitat in the good-excellent range.

Spawning habitat in the low-poor quality range was located in 59% of the remaining pools and 10% were rated as unsuitable for spawning. The low quality and unsuitable ratings were usually attributable to large amounts of boulders, large cobble and the lack of large woody debris (LWD).

Water temperatures in 1998 measured from 50^{o} to 59^{o} F, and at the end of August 2015 the water temperatures were measured at 62^{o} F. Salmonids are known to have upper-lethal thermal limits of 20-24^{o} C, which equates to 68-78^{o} F. The observed temperature range in Benmore creek appears to be in amoderate range for salmonid fish species. Stream shading is the largest contributor to controlling water temperatures by preventing direct sunlight from reaching the water column. The stream canopy density was measured at an average of 72% in 1998 and again at 85% in 2014, which suggests that the canopy has become denser in the 16 years since the first survey. In general, revegetation projects should be considered when the canopy density falls below 80%.

Stream bank vegetation helps shade the water and control water temperature, and is also the main contributor of organic material to the stream, which drives production of macro-invertebrates. The stream bank vegetation was found to be low in 1998, with a measured percentage of 33% for the right bank and 37% for the left bank. A diverse population of macro-invertebrates were found in Benmore creek (stonefly, cranefly, caddisfly, salmonfly and midges), but the population appears to be small due to the lack of organic material and nutrients.

Benmore creek was shown to have a deficiency of LWD. LWD is a natural component of streams that shapes channel geometry, holds gravel from flushing, increases cover, as well as pool habitat and provides organic material and refuge for macro-invertebrates. In general the more LWD present in a stream can increase pool habitat, improve spawning gravel, increase macro-invertebrate populations and usually results in a more diverse habitat. Benmore Creek would benefit from the addition of LWD by holding more gravel, increasing pool habitat and the increase in macro-invertebrate population.

Bucknell Creek:

Bucknell Creek is a third order stream with its mouth located at T18N, R11W,S35 on the Eel River approximately 6.5 miles downstream of the confluence with Benmore Creek. Bucknell Creek provides approximately 4.5 miles of anadromous habitat for NC steelhead and Pacific lamprey. The anadromous habitat ends at a natural barrier approximately 4.5 miles upstream and only resident trout are found above this location. The fish habitat ends approximately 7.8 miles upstream from the mouth where the flow is reduced to less than 0.1 cfs and is subsurface in many areas.

Bucknell Creek was surveyed by California Department of Fish and Game in 1995 from the headwaters near Elk Mountain downstream for 9,504 feet (1.8 miles). The results of this survey are summarized below:

Bucknell Creek is characterized by B3 Rosgen channel type which is dominated by cobble and small boulder substrate. This channel type generally has a low-moderate gradient (2-4%) with a moderate sinuosity rating (>1.2). The stream channel is located in a steep V-shaped canyon.

The survey showed that the stream has a pool/riffle ratio of 70:30 (2.33) which is excellent. The average pool depth was reported to be approximately 3 feet with an overall stream depth average of 18 inches. Spawning gravel was found to be lacking with only 15% of the substrate falling into this category. The dominant substrate was found to be cobble with a sub-dominant of small boulder. Streambed gravel suitable for spawning was found to be very sparse, making up only approximately 2% of the survey area. The lack of gravel indicates a low spawning value for anadromous fish but the high amount of pool habitat shows the stream has high potential for rearing habitat for juvenile salmonids.

Water temperatures measured consistently 47^{o} F, which is excellent for cold water species such as steelhead and Chinook. The highest water temperature found was 50^{o} F in a section of open canopy, but this section was small and not the normal conditions found throughout this stream reach. Canopy cover was found to be high (90%) which helps to limit water temperature and provides overhead cover. The canopy consisted of willow, alder, bigleaf maple, live oak, black oak, manzanita, dogwood, thimbleberry, hazelnut, horsetail, columbine and wild raspberry. The transition zone to the upland provides a change to conifers, mainly Douglas-fir and Ponderosa pine. The vegetation type and quantity was found to be consistent throughout the survey area. The overall streamside vegetation was found to be dense to abundant throughout the survey area.

The survey results showed a low density of macro-invertebrates in the survey area. The reason for the low population of invertebrate food sources is unknown. Local agricultural activities on private land have been known to effect water quality in the past which allowed fertilizer to enter the stream. The addition of fertilizer in the stream can cause elevated levels of filamentous algae and can also lead to nitrogen poisoning of fish, and limit insect production. The local agricultural activities are also expected to be responsible for altering summer stream flow and limiting access for anadromous fish at a critical time (low flow). Unauthorized water diversions on National Forest System lands have been addressed in this watershed in the past, but the US Forest Service has no authority over activities occurring on private lands within the watershed. Employee safety concerns due to private agriculture activities have prevented any survey efforts in Bucknell creek for over a decade; therefore new information or data collection has not occurred.

Like Benmore Creek, the mouth of Bucknell Creek is choked with a build-up of aggregate which limits anadromous fish access to the creek during low flows. The stream itself showed a lack of good spawning gravel which suggests the stream is not retaining its' gravel, which is likely due to the lack of LWD. The stream was rated as poor for suitable spawning gravel by CDFW, with only 2% of the substrate comprised of suitable spawning habitat, but the stream was found to be valuable for juvenile salmonid rearing habitat.

Packsaddle Creek:
Packsaddle Creek is a second order stream located above Scott Dam at T18N, R10W, S25 on the Rice Fork arm of Pillsbury reservoir. This stream provides no anadromous habitat and is thought to be fishless, although Sacramento pikeminnow have been observed in the lower section of Packsaddle Creek (below fish barrier) and Rice Fork near the project area. The middle reaches of Packsaddle Creek provide limited habitat for Foothill yellow-legged frog, and the lack of fish in this stream increases the quality of the available amphibian habitat. The stream also provides moderate habitat for the WPT in the middle reaches were it contains suitable deep pool habitat.

No survey of habitat conditions has been conducted in Packsaddle Creek, so the conditions in this stream are based upon field observations and historical knowledge. Packsaddle Creek is a large truncate stream system with several tributaries branching out from the main channel. The watershed drains into Lake Pillsbury above Scott Dam. The upper headwater areas of tributaries and the main channel lack surface flow from approximately June until the influx of water from storms in the fall. The reduced flow causes pools to lose connectivity and limit migration of aquatic organisms preventing them from avoiding predation or desiccation.

The Packsaddle stream system was visited in August and September of 2015 by Upper Lake Ranger District, Fisheries Biologist to assess the quality and quantity of aquatic habitat, the results are summarized below:

The tributary streams that feed the flow of Packsaddle Creek originate from known previously identified springs and seep areas. In 2015 these springs were found to be dry which result in dry headwater stream reaches. No residual pools were found in these upper headwater stream reaches within the tributaries of Packsaddle Creek, which indicates there is no suitable habitat for FYLF or WPT in these tributaries. The main stem of Packsaddle creek does have residual pools that can support both the FYLF and WPT; however, these pools are shallow (<2 feet) and have no connectivity due to lack of surface water. The lack of connectivity and shallow nature of these pools indicate poor quality habitat for FYLF and WPT.

Project Elements

The following Project Elements (PE), activities within the proposed action that are considered for analysis, were used for this effects analysis.

PE-1: Vegetation Management

PE-2: Fuels Treatment

PE-3: Road Use and Maintenance

Action Area: Effects from the identified PEs will be considered only in the anadromous habitat within or near the project area. This includes the following river reaches:

- Benmore Creek – mouth to River mile 2.5
- Bucknell Creek – mouth to River mile 4.5
- Mainstem Eel River confluence of Bucknell to confluence of Benmore – 6.5 miles

The remainder of the project area is either disconnected from anadromous habitat by Scott dam, or no actions are proposed that would affect anadromous habitat; therefore, this area will no longer be considered for analysis in this assessment.

VI. Effects of the Proposed Actions

The potential for effects are defined below:

Discountable – an action that would have no detectable change to a resource.

Negligible – an action that may cause a change to a resource, but the change would be so small that it would not be of any measurable consequence to the resource and would cause no impairment to the resource.

Minor – an action that may cause a change to a resource, but the change would be small and if measurable, it would result in a small and localized consequence, but would not cause impairment of the resource.

Moderate – an action that would cause some change to a resource and the change would have a definite and measurable consequence, but is localized in the extent of the impact (confined to a small area). Moderate impacts have the potential to slightly impair the resource.

Major – an action that would cause a definite change to a resource and the change would be readily measurable and would have a substantial consequence to the resource. Major impacts may be significant and could result in resource impairment.

Threatened, Endangered, Proposed and Candidate species:

Anadromous: NC Steelhead trout, CC Chinook salmon and SONCC Coho salmon:

Alternative 1 (No Action)

A. Direct and Indirect Effects

Fuels treatments:

Alternative 2 is the "no action" alternative and this means that no fuels treatments would be implemented. No prescribed fire would be performed to reduce fuel loads, which may result in an increase in overall fuel load in the planning area. No hand piles would be built or lit near Benmore Creek allowing fuels to increase in the riparian area. No direct or indirect effects would occur to anadromous fish or their critical habitat from implementation of the "no action" alternative for Fuels treatments.

Alternative 2 is the "no action" alternative and this means the current fuel load would persist into the future. A continued recruitment of fuel would allow the fuel load to increase and elevate the risk of a catastrophic wildfire to occur. A large scale fire with areas of moderate and high severity post-burn conditions could result in significant changes to riparian and stream habitats. These changes include loss of riparian vegetation, loss of canopy cover and the denuding of ground cover that may lead to increased erosion and sedimentation. A high intensity fire in the project area could result in an increase in sedimentation and changes in the riparian habitat that could reduce/not change the habitat suitability for many years (5-10). High severity fires that burn with high temperatures and to a greater extent across the landscape remove vegetative cover and often leave bare mineral soil that is vulnerable to erosion and sedimentation (Arkle and Pilliod, 2010). Compared to the proposed action, the risk of impact to riparian vegetation and instream habitat from a wildfire would be higher because of the continued increase in the fuel load. Implementation of this alternative would not meet project objectives for fuels treatments.

Vegetation Management:

Implementation of the "no action" alternative would result in no direct or indirect effects to anadromous fish or coho critical habitat. No timber would be removed and no heavy equipment would be used for timber operations; therefore, no direct or indirect effects would occur from vegetation management in the Action Area.

Under the "no action" alternative the timber within the planning area would continue to grow and the stand density would continue to increase, which could increase competition and decrease stand vigor. Implementation of the "no action" alternative would not meet the project objectives for vegetation management.

Road Use and Maintenance:

Implementation of the "no action" alternative would result in no direct or indirect effects to anadromous fish or their critical habitat because no actions would occur and the area would continue under the current OHV and vehicle use.

If the hydrologically connected road segments (HCS) in the project area are not repaired, they will continue to deliver sediment to the streams in the Action Area. This would mainly occur in Benmore Creek and to a lesser extent in Bucknell Creek, based on the existing number of road miles associated with each watershed. Existing gullies and rills would be expected to increase, thereby accelerating sediment delivery to stream channels. Unstable banks associated with failed culverts would not be restored through culvert replacement, and thebanks would continue to erode and deliver sediment to the watershed.

A potentially worse outcome is the failure and overtopping of plugged culverts, which could result in the loss of road fill directly into the stream. This type of event can result in a localized reduction in habitat quality as pool volume is reduced and the stream becomes embedded from fine sediment.

Alternative 2 (Proposed Action)

A. Direct and Indirect Effects

Fuels treatments:

Fuels treatments in the Pine Mtn. project area are not directed at excluding fire, but rather at improving landscape resilience to fire events by having fuelbeds that are within the natural range of variability (see proposed action). Approximately 7830 acres (76% of project area) are proposed for prescribed fire treatments (see map appendix A). Thinning of trees may occur in units when necessary to modify fire behavior and assist in holding fire lines.

There would be no ignition of fire in close proximity to Benmore or Bucknell creeks. Prescribed fire is proposed along approximately ½ mile of the north side of Bucknell Creek and 1 ½ miles of the east side of Benmore Creek (see map, Appendix A).

The following management requirements apply to prescribed fire:

- No dozer line construction within 100 feet of perennial and intermittent streams, or 50 feet of ephemeral streams.
- No direct ignition within 300 feet of perennial streams or 150 feet of intermittent streams, but allow the fire to back into the riparian reserve.
- No handline construction within 100 feet of perennial or intermittent streams, or 50 feet of ephemeral streams, except when there is no alternative to meet objectives.
- Maintain 75% ground cover within 100 feet of perennial streams and within 50 feet of intermittent and ephemeral streams.
- Burn piles will not be built or ignited closer than 50 feet from a perennial stream or 25 feet from intermittent and ephemeral streams.
- Maintain flame lengths of 4 foot at the 90th percentile fire weather conditions.

Prescribed fire is proposed along approximately ½ mile of the north side of Bucknell Creek (11% total length) which is located along the final portion of anadromous habitat. Fire is also proposed to be introduced along the upper 1 ½ mile of the east side of Benmore Creek, mainly above the available anadromous habitat (see map, Appendix A). The desired result of the prescribed fire is a mosaic burn type close to the creek with low burn severity and unburned areas dominating. There may be some localized impacts to individual or groups of riparian trees, but the loss of riparian vegetation is expected to be negligible.

Beche et al., 2005, found that prescribed fire affected only 4.4% of the riparian vegetation even when ignited within the RCA. Arkle and Pilliod, 2010, found no statistically significant change in stream shading from a prescribed fire in which ignition was excluded from the riparian area and where allowed to back into the riparian vegetation. The proposed action requires flame lengths of 4 feet which is less than the 5 foot flame lengths used by Beche et al., 2005. Therefore, it is expected that the effects from the proposed action would be less or similar to what he reported. The effects of prescribed fire on anadromous habitat in Benmore and Bucknell Creek is expected to be negligible.

Prescribed fire actions that could lead to an increase in sedimentation are fireline construction, building and ignition of handpiles and the fire itself. Construction of firelines removes surface vegetation and exposes bare mineral soil, which can lead to erosion and sedimentation. Dozer and handlines would not be allowed closer than 100 feet from Benmore and Bucknell Creeks, except under limited circumstances. The lack of treatment within 100 feet would interrupt the connectivity between the fireline and the aquatic feature and assimilate any sediment generated. Also, BMPs would further reduce the risk for excessive sedimentation into the watersheds. Ground cover requirements further minimize the potential sediment created by limiting the amount of bare ground that is vulnerable to erosion. Fire line rehabilitation includes installing waterbars and covering bare ground with leaf litter. This helps limit erosion by reducing the amount of erodible fireline length and increasing ground cover.

No burn piles would be built or ignited closer than 300 feet from Benmore and Bucknell Creeks. Burn piles occupy a small area (6-10 feet diameter) and the distance from habitat should be adequate to assimilate sediment generated from the erosion of the burnpile footprint.

Part of this analysis relies on the effective implementation of BMPs. Prescribed fire BMPs were evaluated on the Stanislaus National Forest for their effectiveness in 2006 and 2010. The effectiveness was evaluated on ten separate fires of varying size. Prescribed fire BMPs were found to be effective in minimizing or avoiding impacts to water quality in all ten cases (Stanislaus National Forest, 2007 and Stanislaus National Forest, 2011). Regional BMP monitoring summary also showed an effectiveness rating of 100% for prescribed fire BMPs (USDA Forest Service, 2012).

High severity fires that burn with high temperatures and to a greater extent across the landscape remove vegetation, cover and often leave bare mineral soil that is vulnerable to erosion (Arkle and Pilliod, 2010). Arkle and Pilliod, 2010, also showed that higher intensity fires can result in increases in

sedimentation and also take longer to recover (up to 15 years) from the disturbance. The proposed action would involve a low intensity fire within the riparian reserves that is designed to give a mosaic pattern, with unburned areas between the burned areas. The unburned areas and the low intensity burn should retain adequate ground cover to minimize erosion and avoid subsequent sedimentation.

There is some risk that sediment could be delivered to the streams from the burn area but it is expected to be minor, due to the low intensity fire and retention of adequate ground cover (75%) following the burn. Arkle and Pilliod, 2010, found no increases in fine sediment following a prescribed burn when ignition did not occur in the riparian, and the fire was allowed to back into the riparian. Beche et al., 2005, found no statistical difference in fine sediment measures even when ignition occurred in the riparian area. Conditions observed in these two studies are expected to be similar to the prescribed fire outcomes predicted for this project.

There is a low risk of prescribed fire activities delivering fine sediment to the streams in the Action Area; however, it is expected to be minor. Restrictions within RCAs, effectiveness of BMPs, adequate ground cover retention and low intensity fire should further reduce sedimentation from prescribed fire.

There is a chance that a prescribed fire may burn at a higher intensity than is expected and this can cause a reduction in canopy cover. This is expected to occur on a very limited basis where fuel accumulations are high (i.e. “Jackpots”). In these highly localized areas individual or small groups of trees could be killed, but the overall extent is expected to be very limited. With the limited extent of tree mortality the canopy cover is expected to have a negligible change. In units that prescribed fire follows mechanical fuel reduction treatments (thinning, biomass, mastication), the ladder fuels would be removed. The elimination of ladder fuels should help keep the fire on the ground and easier to maintain the 4 foot flame length that is required by the prescription.

Vegetation management:

No mechanical vegetation management activities are proposed to occur near stream channels; therefore no direct effects are expected on anadromous fish from the implementation of the Pine Mountain project. No culverts crossing fish bearing streams are proposed for removal or replacement further reducing the risk of direct effects to fish.

There would be no loss of riparian vegetation in the action area due to the RCA buffers in place and the effectiveness of BMP in relation to timber harvest. The exclusion zone along streams will restrict mechanical equipment from within 50 feet of the streambank which would prevent impacts to riparian vegetation. The management requirement to retain hardwoods should further help protect riparian obligate hardwood species by limiting damage or removal of these species.

Mechanical treatment of general forest is proposed to occur along approximately ½ miles of Benmore Creek (16% of total length). All of the proposed activities are confined to the east side of the drainage.

There is a risk of sediment reaching the stream due to ground disturbance from heavy equipment. Rubber tired skidding has the highest potential to cause detrimental ground disturbance because of multiple passes over the same ground. Multiple passes by heavy equipment over the same ground can lead to detrimental soil compaction which has a low filtration rate and can lead to the erosion of bare soil and sedimentation introduce to the watershed. Heavy equipment would not be allowed closer than 50 feet from stream channels which should provide an adequate buffer to intercept and assimilate any sediment produced by vegetation management. This is particularly true on slopes with lower angles (<15%) that typically occur next to the stream. Lowered angled slopes deliver less sediment through a buffer than higher angled slopes (Elliot et al., 2010).

Operation of biomass and mastication equipment has a lower potential for soil compaction and sediment production. This is because they have much lower ground pressure and do not make multiple passes over the same ground. These are generally tracked vehicles which spread their weight out over a larger area and do not cause large areas of bare soil. Further, mastication equipment would spread the shredded material over the ground thereby increasing ground cover and reducing erosion potential. As previously noted, increasing ground cover is an effective way to minimize erosion from vulnerable areas.

Mechanical equipment operations are proposed to occur in two units #50 (8 acres) and #51 (5 acres) on the west side of the headwater of Benmore Creek. These units are located below forest road #18N05 and ¼ mile upslope of Benmore Creek between two intermittent tributaries. The RCA buffers on the tributaries and the distance upslope from the main channel should intercept and assimilate any sediment produced from these units during implementation.

General forest and hand thinning could occur along approximately one and a half mile of the east side of Benmore creek (see project map). This may occur on approximately 332 acres in unit #90. This unit has the potential to effect approximately 5000-6000 feet of headwater riparian habitat. The RCA exclusion zone and the effectiveness of BMPs should minimize any impacts to the stream channel and keep sedimentation negligible.

A part of this analysis relies on the effective implementation of BMPs. The Mendocino National Forest evaluated BMPs related to timber harvest for implementation and effectiveness; sites evaluated included skid trails, log deck landings, timber sale administration, streamside management zones, meadow protection and vegetation manipulation (e.g., mastication/shredding). From 2006 to 2010, 76 evaluations were done and 100% were found to be effective for BMPs related to landings, timber sale administration, streamside management zones, meadow protection and vegetation management. Skid trail BMPs were found to be effective at 93% of sites evaluated. Monitoring data from across the entire region was evaluated for the years 2003-2007 and found that BMPs related to timber harvest were effective 96% of the time (USDA, 2012 and Stanislaus National Forest, 2008). Four National Forests from the Cascades and Sierra Nevada reported that USFS streamside management zone BMPs were effective in preventing sediment from entering streams (Litschert and MacDonald, 2009).

Mechanical equipment operations and hand thinning could reduce general forest canopy while retaining an overall canopy of 60% in riparian reserves. As discussed above the current canopy cover in Benmore Creek is 72% (moderate) and Bucknell Creek is 90% (excellent). There could be a short term decrease in riparian canopy resulting in an increase in sunlight reaching the water, which could increase water temperatures. The RCA exclusion zone, riparian hardwood retention requirements and the riparian reserve retention requirements should reduce the risk of water temperature increases.

Road use and maintenance:

The proposed road actions have the potential to affect fish habitat through physical disturbance and sedimentation of habitat. The roads in the project area are typically outside of riparian reserves with the exception of stream crossings. Stream crossings are the areas with the highest risk of impacts to anadromous habitat in the project area. The proposed actions for roads would be confined to the existing road prism, especially at stream crossings; therefore, the risk of mortality or injury to individuals would be discountable.

Road treatments are proposed to occur on approximately 30.1 miles of Forest Service roads within the project area and those treatments include: maintenance, reconstruction, decommissioning and road closure (see proposed action). These activities would include road surface repair, maintenance and construction of drainage structures, culvert replacement and cleaning, stabilization features and improving operational access. These actions have the potential to produce short term increases in erosion and subsequent sedimentation because they involve disturbance to the road surface. Sediment from the road prism following maintenance/reconstruction is expected to be the highest in the first two years and then is expected to decrease sharply. Stafford (2011) observed a significant increase in sediment transported to the stream channel for up to two seasons following grading and/or road construction, due to ground disturbance that loosens soil and makes it vulnerable to erosion. The increased sediment should decrease after two years from maintenance of the current road system, installation of drainage features, replacement and cleaning of culverts and remediation of hydrologically connected road segments from the streams. Gravel adds surface cover to the road and holds fine sediment together in a tight matrix that is not readily erodible.

Part of the analysis of effects relies on the effective implementation of BMPs. Road treatment BMPs would be implemented to ensure adverse impacts to water quality are minimized or avoided. BMPs related to road treatments were evaluated for implementation and effectiveness from 2006 to 2010. Monitoring sites included; stream crossings, slope protection, road surface drainage, decommissioning, construction of temporary roads, control of sidecast material, water source development and management of roads during wet periods. There were 84 sites evaluated and all of them had ratings from 85% to 100% effectiveness, except water source development which was found to be 75% effective (Stanislaus National Forest, 2011b). A regional summary of monitoring data between 2003 and 2007 found an effectiveness rating of 85% for road construction/engineering BMPs (USDA Forest Service, 2012). The monitoring data demonstrates the effectiveness of regional road treatment BMPs at

protecting water quality. Road treatments in the Pine Mtn. project area are expected to result in minor and short term localized increases in erosion and sedimentation.

A road inventory was conducted in 2015 to determine hydrologically connected segments (HCS) of unpaved roads that deliver sediment directly to streams during storm runoff events. The HCS protocol (Frazier and Grant, 2006) identifies HCS for each road and ranks the severity of impact based on the frequency and volume of sediment delivered. The survey identified 23 road segments that were hydrologically connected which totaled 8.86 miles (46,783 feet) of road (see hydrology report). The road system in the project area was found to be 29% connected to the watersheds (see hydrology report).

One potential drafting site was identified in connection with anadromous habitat and it is located at the Eel River crossing of the M1 road (see map, Appendix A). The following project design features will apply to water drafting sites:

- Locate water drafting sites to avoid adverse effects to in-stream flow and depletion of pool habitat.
- Streambank and in-channel excavation will be kept to a minimum.
- Use pumps with low entry velocity (350 gpm) to minimize removal of aquatic species.
- Use screening devices on water drafting pumps to avoid juvenile fish removal.

Screen mesh criteria:
Screen mesh must be in good repair and present a sealed positive barrier effectively preventing entry of the “design fish” into the intake. The design fish in this case is an immature (20-30mm) salmon or steelhead fry.
Screen mesh size shall be:

- Round openings – max. 3/32 inch diameter (.09 inch)
- Square openings – max. 3/32 inch diagonal (.09 inch)
- Slotted openings – max. 1/16 inch width (.07 inch)

B. Cumulative Effects

The spatial bounding of the cumulative effects analysis area is restricted to the Action Area. This bounding was chosen because the effects of the proposed actions would be limited in intensity and duration, and would not likely be detectable downstream of the project area. Since the loss of riparian vegetation and loss of canopy cover are only applicable at the level of the treatment unit, their effects would limited to the project area. There is a slight risk of an increase of sedimentation from some of the proposed actions. However, this risk is relatively small and the observable effects would likely be undetectable downstream of the project area.

The temporal bounding of the cumulative effects analysis area was chosen because the project hydrology report indicated through Cumulative Watershed Effects (CWE) modeling that the effects from this project would not be detectable after ten years.

In order to understand the contribution of past human actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the cumulative impact of all prior human actions that have affected the environment and might contribute to cumulative effects. This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. By concentrating on existing conditions we are sure to capture all the residual effects of past human actions, regardless of which action contributed those effects.

The Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions."

The cumulative effects analysis in this (EA or EIS) is also consistent with Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR 220.4(f)) (July 24, 2008).

For these reasons, the analysis of past actions in this section is based on existing environmental conditions.

Two continuing actions were identified that could cumulatively add to the adverse effects on aquatic habitat.They are livestock grazing on the Pine Mountain and York Cabin Allotments, and continued OHV use of the trail system within the project area.

The project area is within the Pine Mountain and the York Cabin Allotments. The permittees currently operate on these allotments, with 46 head of cattle on York Cabin allotment and 52 head of cattle on Pine Mountain allotment. The permittees work closely with the USFS, Upper Lake Ranger District to regulate the rotation of animals and release their animals in different areas of the allotment separated from south to north. Since allotment use has remained relatively constant, it is assumed that the existing conditions of the streams in the action area represent the combined effects of all past actions and natural factors, including grazing.

Benmore Creek show a lack of riparian vegetation that could be used for browse, with riparian canopy cover running between 46% and 88% with the anadromous reaches showing less than 75% canopy cover. The lack of extensive browse along Benmore Creek suggests that there is little reason for cattle to congregate in the riparian areas, except for water. Given the lack of forage adjacent to the stream and the good quality of available forage in the nearby glades (i.e., Montgomery glade), the effect of livestock grazing relative to sedimentation is expected to be minor and short lived.

The upper reaches of Benmore Creek have steep banks and the stream is confined to a narrow V-shaped canyon. This type of topography makes it very difficult for livestock to gain access to the stream and

naturally limits grazing intensity. Since Benmore and Bucknell Creeks are a known water source for cattle, there is some evidence of trailing paths to and from the streams. These paths are considered to have a small impact to the stream channels due to the dense forest in the upland, steep canyon walls, poor access to the channels and a fairly stable stream bank armored with rock.

Cumulatively, livestock grazing on the Pine Mountain and York Cabin Allotments are not expected to contribute to the direct and indirect effects of the proposed action to the extent that would exceed the fine sediment threshold that was identified in the hydrology report.

The Pine Mountain area has an extensive OHV trail system that spider webs its way through the action area. The use of this trail system is expected to remain the same as it has been in the past. Currently the system adds a minor amount of sediment to the stream systems from recreational use and trail maintenance.

The Upper Lake Ranger District Hydrologist modeled the cumulative watershed effects (CWE) for the HUC 7 and HUC 8 sub-watersheds in the project area (see hydrology report). These sub-watersheds are Benmore, Dashiell, Lower Bucknell, Upper Bucknell, Packsaddle and Willow (see hydrology report). The CWE methodology uses constant features and past, ongoing and future land management actions to evaluate roaded area (ERA).

The ERA assigned to the past, ongoing and future actions are compared to a threshold established by the hydrologist for the watershed of concern. If the threshold is exceeded or closely approached the cumulative effects of all actions may begin to result in channel alteration. These alterations could cause stream bank instability and channel incision, which may result in erosion and sedimentation to the watershed. If detrimental alterations occur, it would be assumed that essential habitat elements required by anadromous fish may also be adversely affected. Conversely, if the threshold for watershed effects is not exceeded or remains below the threshold, there is very little risk that the habitat would be adversely affected.

The ERA values for all of the sub-watersheds in the cumulative effects analysis area were calculated well below the threshold of concern. Most sub-watersheds showed a spike in ERA values after project implementation, but remained well below the established threshold. The ERA analysis values for all of the sub-watersheds are expected to return to pre-project levels within ten years (see hydrology report).

Alternative 3 (Preferred Alternative) No new temporary road construction

A. Direct and Indirect Effects

Fuels treatment:

The proposed fuel treatment actions for this alternative are identical to the proposed action (Alternative 2); therefore, the direct and indirect effects of this alternative are the same as those for the proposed action.

Vegetation management:

The proposed vegetation management actions for this alternative are identical to the proposed action (Alternative 2); therefore, the direct and indirect effects of this alternative are the same as those for the proposed action.

Road use and maintenance:

The proposed actions for roads under Alternative 3 is essentially the same as the proposed action (Alternative 2); with the exception of no new temporary road construction in Bucknell Creek. The proposed road segment is ¼ mile long (1320 feet) and is located in Bucknell Creek watershed, within the Action Area. The reduced road work should result in a large reduction in ground disturbance and less sediment delivered to streams, when compared to the proposed action. The reduction in ground disturbance and sedimentation should make this alternative slightly more beneficial to anadromous fish and their critical habitat, when compared to the proposed action.

B. Cumulative Effects

Cumulative effects for this alternative are the same as in the proposed action (Alternative 2), with the exception of the Benmore Creek watershed. The hydrology report showed that without the creation of new temporary roads in Benmore Creek that the ERA reduced from 11.53 to 11.51, which is a fairly insignificant difference. The changes in anticipated cumulative effects are so small that the cumulative effects should be similar to those in the proposed action (Alternative 2).

Alternative 4 (No thinning above 10" DBH in Riparian Reserves)

A. Direct and Indirect Effects

Fuels treatment:

The proposed fuel treatment actions for this alternative are identical to the proposed action (Alternative 2); therefore, the direct and indirect effects of this alternative are the same as those for the proposed action.

Vegetation management:

The difference between this alternative and the proposed action is the removal of logging equipment for log removal in the riparian reserve. The action area is confined to Benmore and Bucknell Creeks, which have no log removal proposed in near stream habitat; therefore, the difference in effects between this alternative and the proposed action is insignificant. Since the difference is insignificant the direct and indirect effects for this alternative are the same as the proposed action (Alternative 2).

Road use and maintenance:

The proposed road use and road maintenance actions for this alternative are identical to the proposed action (Alternative 2); therefore, the direct and indirect effects of this alternative are the same as those for the proposed action.

B. Cumulative Effects

Overall differences in effects between this alternative and the proposed action are so small, that the cumulative effects should be similar. The cumulative effects for this alternative should be the same as the proposed action (Alternative 2).

Alternative 5 (No thinning above 10" DBH in known Northern Spotted Owl nesting habitat)

A. Direct and Indirect Effects

Fuels treatment:

The proposed fuel treatment actions for this alternative are identical to the proposed action (Alternative 2); therefore, the direct and indirect effects of this alternative are the same as those for the proposed action.

Vegetation management:

The changes in alternative 5, when compared to the proposed action (Alternative 2), occur outside of the riparian and away from stream habitat; therefore, the direct and indirect effects are the same for this alternative as they are for the proposed action (Alternative 2).

Road use and maintenance:

The proposed road use and road maintenance actions for this alternative are identical to the proposed action (Alternative 2); therefore, the direct and indirect effects of this alternative are the same as those for the proposed action.

B. Cumulative Effects

Overall differences in effects between this alternative and the proposed action are so small, that the cumulative effects should be similar. The cumulative effects for this alternative should be the same as the proposed action (Alternative 2).

VII. Determination of Effects

A. Threatened, Endangered, Proposed, Candidate species and their designated critical habitat

The Action area is located below Scott dam and is in the geographic range for the **CC Chinook salmon ESU**, **SONCC Coho salmon ESU,NC Steelhead DPS, and critical habitat for SONCC Coho salmon**; therefore, it is my determination that the Pine Mountain Late-Successional ReserveHabitat Protection and Enhancement Project"May affect, not likely to adversely affect" the CC Chinook salmon ESU, SONCC Coho ESU, NC Steelhead DPS and critical habitat for SONCC Coho salmon.

VIII. Literature Cited

Alley, D.W. and H.W. Li. 1977. Significance of Microhabitat Selection for Fishes in a Sierra Foothill Stream. Cal-Neva Wildlife Transactions. M.S. Thesis, University of California, Davis, CA. pp 27-33.

Arkle, R.S and D.S. Pilliod. 2010. Prescribed fire as ecological surrogates for wildfires: A stream and riparian perspective. Forest Ecology and Management. 259: 893-903.

Arkle, R.S., D.S. Pilliod and K. Strickler. 2010. Fire, Flow and Dynamic Equilibrium in Stream Macroinvertebrate communities. Freshwater Biology. 55:299-314.

Beche, L.A., S.L. Stephens and V.H. Resh. 2005. Effects of prescribed fire on a Sierra Nevada (California, USA) stream and its riparian zone. Forest Ecology and Management. 218:37-59.

Brown, L. and T. Ford. 2002. Effects of Flow on the Fish Communities of a Regulated California River: Implications for Managing Native Fishes. River Research and Applications. 18: 331-342.

Cech jr.,J., S. Mitchell, D. Castleberry and M. McEnroe. 1990. Distribution of California stream fishes: influence of environmental temperature and hypoxia. Environmental Biology of Fishes. 29: pp 95-105.

Elliot, W.J., I.S. Miller and L. Audin, editors. 2010. Cumulative watershed effects of fuel management in the western United States. General Technical Report RMRS-GTR-231.Ft Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 299 pg.

Frazier, J. and S. Grant. 2006. Clavey River Watershed Analysis Road Inventory Hydrologically connected Segments. USDA Forest Service, Stanislaus National Forest, Resource Management Program Area, 19777 Greenley Rd., Sonora, CA 95370. 8 pg.

Knight, N.L. 1985. Growth of Juvenile Chinook Salmon, (*Oncorhynchus tshawytscha*), Acclimated to Cycling and Constant Temperatures: Application to an Environmental Impact Assessment. National Library of Canada, Simon Fraser University, Burnaby, B.C. pg. 63.

Litschert, S.E. and L.H. MacDonald. 2009. Frequency and Characteristics of sediment Delivery Pathways from Forest Harvest Units to Streams. Forest Ecology and Management. Vol. 259, issue 2 (December, 2009) Pp. 143-150.

Moyle, P.B. and D.M. Baltz. 1985. Microhabitat Use by an Assemblage of California Stream Fishes: Developing Criteria for Instream Flow Determinations. Transactions of the American Fisheries Society. 114: 5, pp 695-704.

Moyle, P., B. Vondracek and G. Grossman. 1983. Responses of Fish Populations in the North Fork of the Feather River, California, to Treatments with Fish Toxicants. North American Journal of Fisheries Management. 3:1, pp 48-60.

Moyle, P.B., R.M. Yoshiyama, J.E. Williams and E.D. Wikramanayake. 1995. Fish Species of Special Concern in California. Department of Wildlife and Fisheries Biology. University of California, Davis, CA. 277 pg.

Moyle, P.B. 2002. Inland Fishes of California. University of California Press. Berkeley and Los Angeles, CA. 446 pg.

Myrick, C.A. and J.J. Cech, Jr. 2000. Temperature influences on California rainbow trout physiological performance. Fish Physiology and Biochemistry. 22: pp 245-254.

NMFS. 2000. Endangered and Threatened Wildlife and Plants: Designation of Critical Habitat for Northern California Steelhead and California Coastal Chinook salmon; Final Rule. Sacramento, California. Federal Register, Vol. 70, No. 170, pp 52516-52517.

NMFS. 1999. Endangered and Threatened Wildlife and Plants: Designation of Critical Habitat for Southern Oregon Northern California Coast Coho Salmon; Final Rule. Sacramento, California. Federal Register, Vol. 64, No. 86, pp 24049-24062.

Robins, C.R., R.M. Bailey, C.E. Bond, J.R. Brooker, E.A. Lachner, R.N. Lea and W.B. Scott. 1991. Common and Scientific Names of Fishes from the United States and Canada.

Stafford, A.K. 2011. Sediment production and Delivery from Hillslopes and Forest Roads in the Southern Sierra Nevada, California. Department of Forest, Rangeland, and Watershed Stewardship. Thesis, Colorado State University, Fort Collins, CO. 190 pg.

USDA Forest Service. 1995a. Mendocino National Forest. Land and Resource Management Plan. United States Forest Service, Pacific Southwest Region, Mendocino National Forest, Willows, California. 263 pg.

USDA Forest Service. 1995b. Mendocino National Forest. Record of Decision, Final Environmental Impact Statement. United States Forest Service, Mendocino National Forest, Pacific Southwest Region. Willows, California. 22 pg.

USDA Forest Service. 2011. Water Quality Management for Forest System Lands in California - Best Management Practices. Pacific Southwest Region, Vallejo, California.

USDA Forest Service 2012. National Best Management Practices for Water Quality Management on National Forest System Lands. Volume 1: National Core BMP Technical Guide. FS-990a. April 2012. USAD Forest Service, Washington Office.

[STF] Stanislaus National Forest. 2007. Water quality best management practices evaluation program, report of BMPEP monitoring 2006. 4p. Unpublished document. On file with: USDA Forest Service, Stanislaus National Forest, Resource Management Program Area, 19777 Greenley Road, Sonora, CA 95370.

Stanislaus National Forest. 2008. Water quality best management practices evaluation program, report of BMPEP monitoring 2007. 5p. Unpublished document. On file with: USDA Forest Service, Stanislaus National Forest, Resource Management Program Area, 19777 Greenley Road, Sonora, CA 95370.

Stanislaus National Forest. 2009. Water quality best management practices evaluation program, report of BMPEP monitoring 2008. 5p. Unpublished document. On file with: USDA Forest Service, Stanislaus National Forest, Resource Management Program Area, 19777 Greenley Road, Sonora, CA 95370.

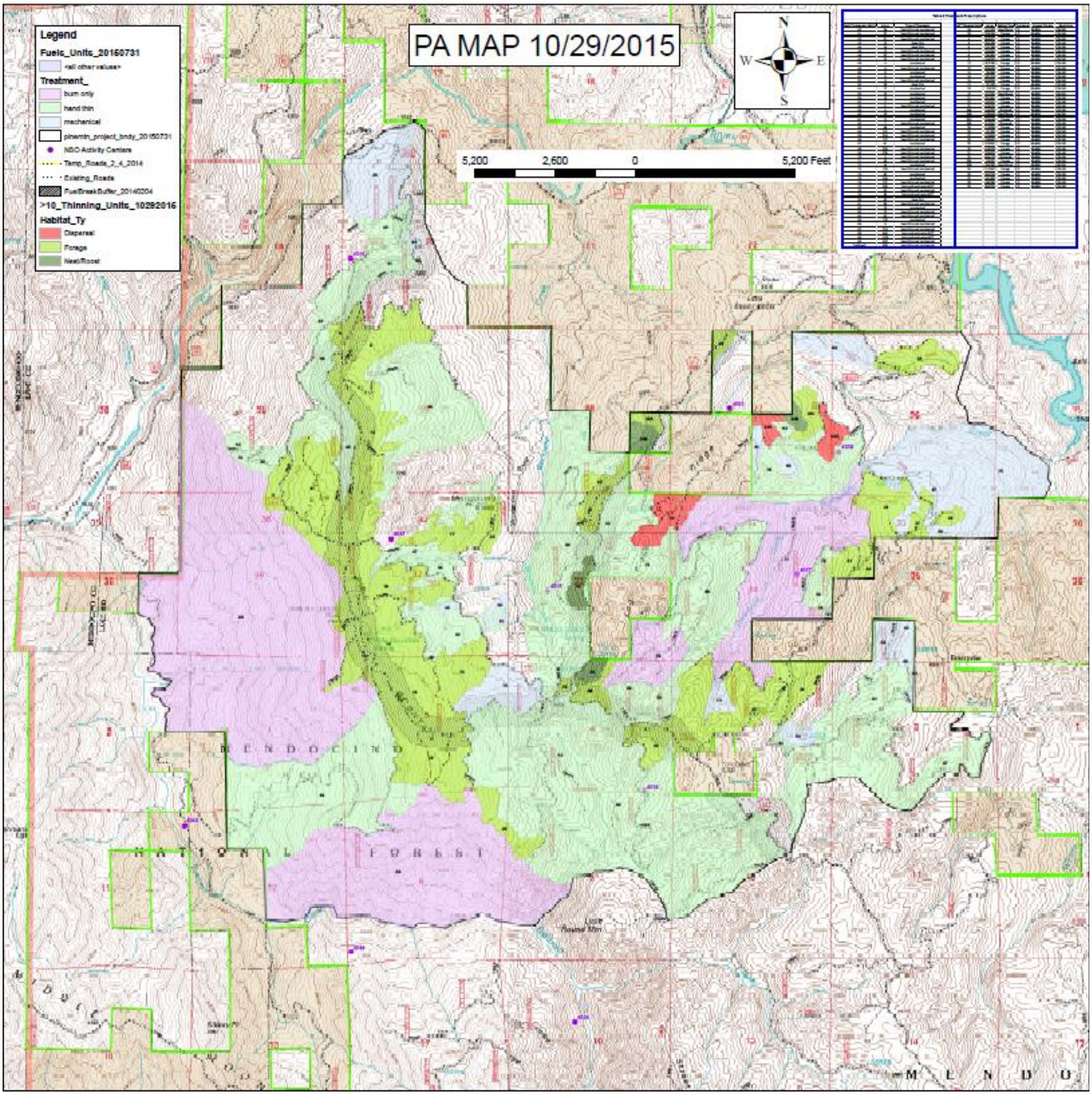
Stanislaus National Forest. 2010. Water quality best management practices evaluation program, report of BMPEP monitoring 2009. 5p. Unpublished document. On file with: USDA Forest Service, Stanislaus National Forest, Resource Management Program Area, 19777 Greenley Road, Sonora, CA 95370.

Stanislaus National Forest. 2011. Water quality best management practices evaluation program, report of BMPEP monitoring 2010. 5p. Unpublished document. On file with: USDA Forest Service, Stanislaus National Forest, Resource Management Program Area, 19777 Greenley Road, Sonora, CA 95370.

Vondracek, B., W. Wurtsbaugh and J.J. Cech, Jr. 1988. Growth and reproduction of the mosquitofish, *Gambusia affinis,* in relation to temperature and ration level: consequences for life history. Environmental Biology of Fishes. Vol. 21, No. 1, pp 45-57.

Appendix A

Maps



Pine Mountain LSR Habitat Protection and Enhancement Project

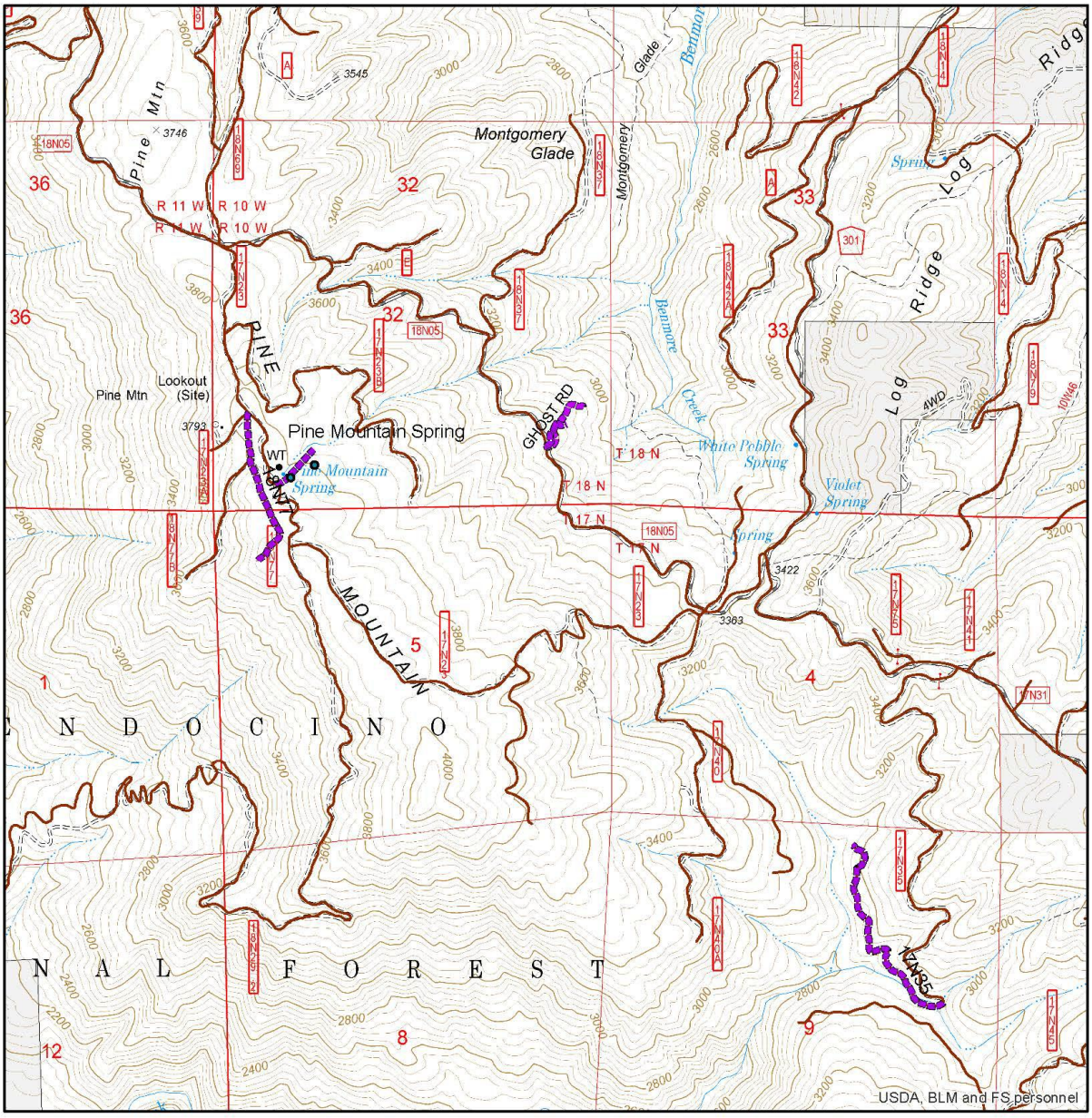
Roads Proposed for Decomission

Road	Total Length (ft)	Length to Decom (ft)	Culverts
18N77	1580	1580	0
Ghost Road	980	980	0
Pine Mountain Spring	273	273	0
17N35	11500	3180	2

Roads proposed for decomission

N

0 0.125 0.25 0.5 Miles



Appendix B

Unit Prescription Description

To meet the purpose and need, the proposed action includes prescribed fire and forest health treatments that focus on enhancing and maintaining vegetative communities for wildlife habitat. Plant community health and biodiversity would be enhanced by applying ecological fuel reduction treatments. Ecological fuel reduction seeks to reduce surface fuels, ladder fuels, and crown density in forested plant communities. In chaparral plant communities, ecological fuel reduction seeks to retain, enhance and protect portions of this valuable habitat while still reducing and modifying fire behavior through prescribed fire treatments that result in a mosaic of burned and unburned areas. Ecological fuel reduction techniques assist the natural environment in becoming healthier and more resilient.

Ecological fuel treatments may be applied as prescribed fire only or as a combination of prescribed fire plus hand or mechanical thinning, piling and pile burning. Mechanical treatments will be followed by periodic understory burning to further reduce surface fuels, activity fuels, or to maintain fuels in the desired condition. Where prescribed burning is used as the primary thinning tool, several entries may be needed to achieve desired conditions. For example, areas may require thinning, piling and pile burning prior to understory burning in order to meet objectives. Or understory burning may require a post thinning activity to reduce standing dead fuels and further need to be understory burned again to reduce the newly accumulated surface fuel loading.

Treatments are designed to be site-specific, taking into consideration vegetation, soil types, slope, aspect, forest health needs and land allocation objectives. Careful planning and consideration ensures that what remains standing is healthy, resilient and compatible with LSR objectives.

LRMP Guidance Vegetation Prescriptions:

The following prescriptions apply to lands designated as Late Successional Reserve, Known Spotted Owl Activity Centers (100 acre Late Successional Areas), Riparian Reserve and Matrix.

Prescription standards were developed taking into consideration

- Late-Successional Reserve prescription RX 6,
- Minimal Management prescription Rx 4,
- Chaparral Management RX 3 and
- Timber Modified RX 7.

The treatment accomplishes the Riparian Reserve Minimal Management prescription RX-4 and Aquatic Conservation Strategy Objectives by emphasizing the need within the Riparian Reserve SMZ portions to scale down the operational magnitude.

The treatment accomplishes the Timber Modified management prescription RX 7 goals by emphasizing the need within the Matrix land allocation to provide for wildlife resource objectives.

Refer to Table 1. Treatment Prescriptions

11.0 Treatment Prescription 1: Non-Commercial Ecological Fuel Reduction Treatment Thinning Plantations Areas

Treatment 1 is a thinning treatment applied to trees that do not have commercial saw log value. This treatment prescription is focused on treating early succession plantation stands that were previously established.

This treatment applies to land designated as Late Successional Reserve, Known Spotted Owl Activity Centers (100 acre Late Successional Areas), Riparian Reserve and Matrix encompassing 364 acres with 349 in LSR and 15 in matrix land allocations. Fuel treatments may be applied as prescribed fire only or as a combination of prescribed burning, hand or mechanical density reduction (thinning), hand or mechanical piling, or chipping. Treatments may be followed on an as needed basis by thinning and prescribed fire to reduce surface fuels or maintain them in the desired condition.

11.1 Thinning Treatment

The thinning treatment shall be applied to trees that do not have commercial saw log value. Residual tree spacing shall range from approximately 15-30 feet. Spacing may vary by 25% less or greater than the expressed range to allow for variability of density and selection of the best leave trees. Implementation may be by hand (chainsaw) or mechanized equipment (i.e. masticator or feller-buncher), depending upon slope constraints as described in the design features.

Retain the largest and most vigorous trees. The desired leave tree selection priority is as follows: hardwoods, sugar pine, Douglas-fir, and ponderosa pine. Retained hardwood sprout clumps should be thinned to retain the 2-3 most vigorous, dominant sprouts. Prune the lower branches of leave trees as needed to raise the canopy height and reduce ladder fuels. Where available retain any existing predominant tree.

Where feasible, avoid thinning pine-dominated plantations between February 1 and July 15 to avoid creating conditions for potential bark beetle breeding and outbreaks, unless slash can be promptly disposed of by chipping, mastication, removal or burning.

11.2 Snag Retention

No snags >10" DBH shall be felled, unless deemed a safety hazard or risk to prescribed fire control. Hazardous snags will be felled and remain on site as coarse woody debris (CWD).

Back Fire Exception: For those units, or portions thereof, that were affected by the 2008 Back Fire retain a minimum of 4 large snags per acre minimum diameter 15 inches and preferably >20inches DBH, unless deemed a safety hazard; if there are less than 4 snags/acre >20" DBH, retain the 4 largest snags available (Late-Successional Reserve Assessment, pg. 52).

11.3 Coarse Woody Debris retention (CWD)

Retain existing large CWD (≥15 inches in diameter, or largest available) up to a total of 5-10 tons/acre.

11.4 Surface and Ladder Fuel Treatments

Slashing/fuels treatments:

Treated material would consist of surface downed woody debris and slash created from thinning treatments, and material would either be chipped and distributed throughout the treatment area, burned on site in piles (hand or mechanically piled), or taken off site. Trees may be pruned to raise canopy base height.

11.5 Riparian Reserve Treatments

Refer to **Treatment Prescription 8 Riparian Reserve Management** for specific operations within Riparian Reserve.

12.0 Treatment Prescription 2 - Non-Commercial Ecological Fuel Reduction Treatment Thinning Naturally Forested Areas

Treatment 2 is a thinning treatment applied to trees that do not have commercial saw log value. This treatment prescription shall be applied to forested areas that express early, mid or late successional structure.

This treatment applies to land designated as Late Successional Reserve, Known Spotted Owl Activity Centers (100 acre Late Successional Areas), Riparian Reserve and Matrix encompassing 3723 acres with 3094 in LSR and 629 in

matrix land allocations. Treatment 2 may be applied as prescribed fire only or as a combination of prescribed burning, hand or mechanical density reduction (thinning), hand or mechanical piling, chipping, or pile burning. Treatment 2 may be followed on an as needed basis by prescribed fire to reduce surface fuels and maintain them in the desired condition. Planned fuel treatment methods are listed in Table 1 Treatment Prescriptions.

12.1 Understory Thinning

The thinning treatment shall be applied to trees that do not have commercial saw log value. Residual tree spacing shall range from approximately 15-30 feet. Spacing may vary by 25% to allow for variability of density and selection of the best leave trees. Where natural stand development has created areas that contain trees less than or equal to 10 inches DBH trees within these areas may be spaced 15-20 feet in the understory of larger trees as long as there is crown separation between the base of the upper canopy and lower canopy trees. Implementation may be by hand (chainsaw) or mechanized equipment (i.e. masticator or feller-buncher), depending upon slope constraints as described in the design features.

Retain the largest and most vigorous trees. . The desired leave tree priority would be as follows: hardwoods, sugar pine, ponderosa pine, and Douglas-fir. Retained hardwood sprout clumps should be thinned to retain the 2-3 most vigorous, dominant sprouts. Prune the lower branches of leave trees as needed to raise the canopy height and reduce ladder fuels. Retain any existing predominant trees where available.

Where feasible, avoid thinning pine-dominant areas between February 1 and July 15 to avoid creating conditions for potential bark beetle breeding and outbreaks, unless slash can be promptly disposed of by chipping, mastication, removal or burning.

Exception Clearance Around Individual Trees: Trees less than 20 inches DBH may be removed from around individual large diameter conifer trees and hardwood species. This treatment may enhance individual tree growth potential and longevity.

12.2 Snag Retention

No snags >10 Inches DBH shall be felled, unless deemed a safety hazard or risk to prescribed fire control. Hazardous snags will be felled and remain on site as coarse woody debris (CWD).

Back Fire Exception: For those units, or portions thereof, that were affected by the 2008 Back Fire retain a minimum of 4 snags >20" DBH, unless deemed a safety hazard. If there are less than 4 snags/acre >20" DBH, retain the 4 largest snags available (Late-Successional Reserve Assessment, pg. 52).

12.3 Coarse Woody Debris retention (CWD)

Retain existing large CWD (>15" diameter, or largest available) up to a total of 5-10 tons/acre.

12.4 Surface and Ladder Fuel Treatments

Slashing/fuels treatments

Treated material would consist of surface downed woody debris and slash created from thinning treatments, and material would either be chipped and distributed throughout the treatment area, burned on site in piles (hand or mechanically piled), jackpot or understory burned, or taken off site. Trees may be pruned to raise canopy base height.

12.5 Riparian Reserve Treatments

Refer to **Treatment Prescription 8 Riparian Reserve Management** for specific operations within Riparian Reserve.

13.0 Treatment Prescription 3 – Commercial Ecological Fuel Reduction Treatment **Thinning and Post-Thinning Prescribed Fire**

The initial treatment follows LSRA guidelines to treat within forested areas to protect forested areas before treating bordering non-forested areas. (LSRA pg. 45) This treatment prescription will be applied to various forested areas that express mid or late successional structure which are located on or near ridgetops or upper slopes. Treatment operations would utilize whole tree removal methods, or removal of the last log with tops still attached. Tree removal will be accomplished by a ground-based system. Activity fuels not brought to the landing during operations may be hand or machine piled and burned if levels exceed desirable surface loading for subsequent prescribed underburning. Slash brought to the landing would be burned on site or utilized as biomass feedstock in on or off site processors, or returned to the various locations within the units. When activity fuels are relocated within the unit they may be treated by burning or left in place as CWD. Post-harvest prescribed underburning would be utilized to further reduce fuel loading.

The intent of the prescription is to promote or sustain late successional habitat by working within current stand heterogeneity. The current heterogeneity is expressed in the variable density found in stand structure as related to tree size distribution, stem spatial patterns, species composition and stand dynamic processes (growth, mortality and regeneration). Ecological enhancement thinning will incorporate the intermediate silvicultural practice thinning from below combined with certain aspects of variable density thinning.

Applied ecological enhancement thinning treatments aim to enhance biodiversity through focusing tree retention on leave trees that provide habitat with structural diversity more suitable to late successional species. Ecological enhancement thinning addresses appropriate tree density reduction to open the lower story canopy to enhance NSO habitat, reduce competition and develop resiliency.

13.1 Thinning from Below with a Variable Retention Objective

Thinning From Below is a silvicultural technique in which lower story trees (usually subdominant trees) are removed. The objective is to reduce the density by increasing the spatial separation between the trees that make up the lower story canopy and the trees that make up the upper story canopy.

Thinning from below will serve to reduce ladder fuels, help raise stand height to crown base, and separate overstory tree crowns from lower story tree crown. Only minor removal of codominant trees which along with dominant and predominant trees provide the canopy structure characteristic that expresses suitable NSO and late successional habitat. No dominant or predominant trees will be removed.

13.2 Variable density thinning:

Variable density thinning is a thinning approach used to create, sustain or restore spatial, structural and compositional heterogeneity throughout the stand. Thinning shall strive to maintain the current mosaic of variable species composition and habitat niches. This approach modifies a traditional thin from below so that a stand is not uniform following treatment.Variable density thinning concept strives for variation in the residual stand, not uniformity.

Elements of variable density thinning that will be incorporated into this project to create or enhance spatial heterogeneity in composition and structure similar to that found in late-successional forests include:

1. Different thinning intensities among units based on seral stage and whether the stand is northern spotted owl nesting/ roosting, foraging or dispersal habitat
2. Some portions of the stand may not be entered to remove trees greater than 10 inches, but may have tree less than or equal to 10 inches removed. Also, prescribed fire may be applied. (Skips).
3. Some portions of the stand may favor hardwood group retention.
4. Some portions of the stand may have lesser spacing retention objectives for large diameter trees and larger spacing retention objectives for smaller diameter trees.
5. Some portions of the stand may have a requirement for greater clearance around a particular tree species.

The proposed thinning would be applied on approximately 1702 acres of mixed conifer stands with 1473 in LSR and 229 matrix land allocations The treatment goal is to sustain a stand that:

1) Continues to provide spotted owl habitat;
2) Provides habitat for other late-successional species;
3) Is more resilient to fire;
4) Possesses, protects and develops an adequate component of larger trees with cavities and defects for nesting/roosting structures, foraging opportunities and dispersal qualities; and
5) Is of appropriate density to maintain the stand in a reasonably vigorous and healthy condition to extend the retention of the large, mature trees and other attributes of suitable late successional habitat such as snags and coarse woody debris(CWD) for as long as possible.

The current species distribution percentages indicate that 66 percent of the forested treatment area is Douglas-fir, 10 percent ponderosa pine, 11 percent sugar pine and 13 percent hardwoods. Field observations indicate that the general conifer tree distribution is consistent over the project area, but hardwood distribution tends to occur as individual trees or concentrated groups ranging from one half acre to five acres. Hardwoods provide late seral structural habitat elements such as large branches, cavities and other structures suitable for nesting, denning and resting for late successional wildlife. The large vigorous crowns produce food for prey species. Hardwoods provide vertical stand diversity, browse, mast and prey for wildlife species; contributing to functional habitat for goshawks, fishers and NSO. In response to the presence of concentrated hardwood groups, hardwood retention group areas shall be established.

The treatment focus is to retain the largest trees that express late seral elements and promote healthy black oak and madrone trees wherever possible. The larger diameter trees are generally at or above the average canopy and have the best opportunity to take advantage of onsite resources to maintain or increase growth. The larger diameter trees generally express a higher degree of fire resiliency. Treatments are designed to maintain the existing native species diversity, including hardwoods, within the unit being treated. The treatment will emphasize retaining the following types of trees:

- All pre-dominant conifer trees (larger, older trees left from previous stands that express late seral structural elements such as large branches, cavities and other structures suitable for nesting, denning and resting), and diameters generally greater than 39 inches DBH;
- All dominant conifer trees as required by the LSRA. Tree diameters are generally 30 to 38 inches DBH;
- Codominant and intermediate conifer trees with growing space in the canopy for crown development. These trees express live crown ratios generally greater than 30 percent and diameters generally less than 30 inches;
- Healthy dominant or codominant hardwood trees (particularly black oak and Pacific madrone).

The treatment will develop species specific retention areas and species specific individual tree growing space enhancement:

- **Retention Areas (Skips):** These areas will not be treated to remove trees greater than 10 inches DBH. They are small areas generally one half acre to two and a half acres which contain coarse woody debris (CWD) concentrations, or hardwood concentration not requiring treatment to reduce conifer encroachment. These areas may be included in prescribed fire treatments.

- **Hardwood Retention Group Areas:** Hardwood retention group areas will be prescribed with the removal of encroaching conifer that are over topping the hardwoods and impeding their growth and vigor. Conifer trees will be removed from beneath the drip line and out to a distance of 5 feet from the hardwood crowns to enhance sunlight and growing space.

- **Variable Spacing Retention Objectives:** The retention objective for larger diameter trees shall focus on shorter spacing distance to maintain canopy closure. Smaller diameter trees spacing distances will focus on larger spacing distances to develop crown and stem diameter to encourage and to enhance late seral habitat structural characteristics.
- **Clearance Around Individual Trees:** Individual large diameter ponderosa pine, sugar pine and hardwood species with black oak being the predominant large diameter hardwood species shall be treated to enhance their growth potential and longevity by removing trees from the east, south and western quadrants to cause crown separation of a minimum of five feet from nearby trees canopies.

First priority for removal would be the smaller trees generally 20 inches DBH or less. These trees are normally below the average canopy and would eventually die as a result of competition for light, water, and nutrients. Some codominant trees would also be removed to increase growth of adjacent trees and to meet the desired residual stand density. Generally, the following types of trees would be removed from the stand:

- Suppressed conifers (diameters generally less than 14 inches);
- Intermediate conifers without growing space in the canopy for crown development (diameters generally less than 18 inches);
- Codominant conifers that do not have growing space in the canopy for further crown development (diameters generally less than 24 inches), or
- Codominant trees needed to reduce stand density to desired levels; and
- Codominant, intermediate, and suppressed conifers adjacent to pre-dominant conifers, or dominant / codominant hardwoods, to enhance survival of theses leave trees.

The treatment will retain wildlife habitat elements:

- **Snags:** Retain all snags >10" DBH, unless deemed a safety hazard or which have the potential to spread fire (fall/spot) across control lines. Hazardous snags and snags >15 inches DBH felled to facilitate burning operation will be retained as coarse woody debris (CWD).
- **Coarse Woody Debris:** Retain existing large CWD (>15" diameter, or largest available) up to a total of 5-10 tons/acre.

13.3 Riparian Reserve Treatments

Refer to **Treatment Prescription 8 Riparian Reserve Management** for specific operations within Riparian Reserve.

14.0 Treatment Prescription 4 Prescribed Fire

The treatment purpose is centered on prescribed fire. The proposed treatment would be applied on approximately 2068 acres of mixed conifer stands with 821 in LSR and 1247 matrix land allocations The introduction of prescribed

fire can contribute to the long-term maintenance of forest fuels and overall ecosystem health. The fourth treatment prescription will be applied to multiple areas covering all vegetation types. Multiple entries may be needed to achieve desired conditions. Prescribed burning may include various types of burning such as pile burning, understory burning and jackpot burning. Prescribed fire may be applied as pre-thinning prescribed burning, post-thinning prescribed burning, or as prescribed burning only. If applied as prescribe fire only some minor tree thinning less than or equal to 10 inches DBH may be necessary to facilitate burning operations. Other actions such as brushing of roads, snag removal for fire and safety hazard reduction and/or line construction will be utilized as needed for prescribed burning operations.

15.0 Treatment Prescription 5 Shaded Fuel Break

Shaded Fuelbreaks are a fuel-reduction technique for forested areas where vegetation is reduced and/or modified to reduce fire hazard in strategic locations on the landscape. Shaded fuelbreaks treat surface, ladder fuels and tree canopy bulk density. This break in fuel continuity is expected to change fire behavior. Fuel reduction activities will create safer and more effective areas for fire-suppression efforts, and contribute to future prescribed fire activities. The proposed treatment would be applied on approximately 1040 acres of mixed conifer stands with 823 in LSR and 217 matrix land allocations. However, only 145 acres are not within other treatment units. The shaded fuel break is designed to be 500 feet in width covering 250 feet of each side of an associated road or may vary larger on one side or the other depending on slope or ridgetop location.

Where the fuelbreak passes through proposed treatment units, the appropriate unit-specific prescriptions would be applied. Therefore, within the fuelbreak the unit specific treatments would be applied in plantation areas or in naturally forested areas. In addition, prescribed fire may be applied. These treatments would be accomplished through mechanical and hand thinning, piling, and burning.

Where the fuelbreak does not pass though the proposed treatment units, the proposed fuelbreak treatment would be thinning trees that do not have commercial saw log value to a tree spacing of 15-30 feet. Spacing may vary by 25% to allow for variability of density and selection of the best leave trees. Where chaparral dominates, specifically the north end of the fuelbreak on slopes greater than 35% with high and very high erosion hazards, brush patches of up to 10-15 feet in diameter would be retained to a 30-50 feet spacing between adjacent brush patches.

16.0 Treatment Prescription 6 Chaparral Management

The treatment consists of using prescribed fire as the primary tool for strategic fuel reduction that breaks up the continuity of large chaparral fields without resulting in large-scale changes in habitat type. Prescribed fire use will stimulate chaparral regeneration, contribute to the development of, diversity in seral stages and reducing fuel loading. Prescribed burning will be conducted to minimize impacts to forested areas intermixed within areas dominated by chaparral fields. Protection measures may include activities such as using strategic ignition areas. Strategic ignition may include using tactics such as lightning above a forested area, lighting along a ridgelines, controlling distance between active ignitions, and using natural barriers. Prior to actual burning activities preparation operations may include hand or mechanical thinning of trees that do not have commercial saw log

value to a 15-25 feet spacing, brushing of roads, line construction and brush removal. Burning would be performed by hand and/or aerial ignition sources. Within the treatment areas, a mosaic of burn severity would be created. In general, this mosaic would be based on existing vegetation conditions.

17.0 Treatment Prescription 7 Back Fire Fuel Reduction

The treatment consists of using prescribed fire for reducing surface fuel loading, reducing tree density and maintaining fire return interval within the 2008 Back Fire perimeter. Burning would be performed primarily by hand or aerial ignition sources. Thinning trees that do not have commercial saw log value may be used to facilitate burning operations. Brushing of roads, line construction and brush removal may be done as preparation for burning. In addition, within areas of heavy surface fuel concentration, piling and pile burning, or jackpot burning may be utilized to facilitate burning operations. The treatment goal is to follow up on the naturally ignited 2008 Back Fire to continue to develop a fire interval that restores and enhances the burned area's ecological function.

18.0 Treatment Prescription 8 Riparian Reserve Management

Treatments within the identified protective buffers (e.g. Riparian Reserves, SMZs and other sensitive areas) would be undertaken to reduce stand density, enhance stand health, and decrease fuels. Thinning would increase the resiliency of the buffer to natural disturbance regimes, and this type of thinning is consistent with the ACS Objectives (BMP 1.19).

18.1 Commercial Ecological Fuel Reduction Treatment**within Riparian Reserves will follow prescription 3 guidelines** with the addition of the following:

- Within the outer portion of the riparian reserves, which is from the SMZ out to a total of 150 feet, the thinning prescriptions would be the same as the stand-specific prescriptions. Trees within the riparian reserve will be directionally felled in a manner to prevent impacts to stream banks.

- Retain all riparian-associated vegetation including within the RRs of seeps, springs, and unstable areas.

- Tractor piling is not permitted within the RRs on slopes >25%; however, mastication or grapple piling is permissible within the RR, but outside of the SMZs on slopes <35%.

- Hand removal (with chainsaws or hand tools) of vegetation within the SMZ is allowed, with location and burning of piles to follow the SMZ guidelines below. Retain 70-75% of existing ground cover (litter/duff) in the SMZ.

- Within the SMZ, only trees less than 10 inches DBH would be thinned from below on 15-25 foot spacing, with leave tree spacing dependent upon tree size and crown diameter.

- Retain canopy cover consistent with the unit prescription, with a minimum of 50% in intermittent and ephemeral SMZs, and 70% in perennial SMZs.

- On slopes of <50%, retain 70-75% of existing ground cover (litter/duff) in the SMZ, and 60-65% of existing ground cover (litter/duff/rocks) in the remainder of the riparian reserve.

- On slopes >50%, retain 70-75% of existing ground cover (litter/duff/rocks) in the entire riparian reserve.

- Cover bare soil areas that exceed 50 square feet with mulch or slash, at the ground cover level appropriate for the slope class, if the area is likely to deliver sediment to a stream.

18.2 Non-Commercial Ecological Fuel Reduction Treatment**Thinning and Fuels Treatment within Riparian Reserves**

Non-Commercial Ecological Fuel Reduction Treatment**within Riparian Reserves will follow prescription 1 guidelines** with the addition of the following:

- Vegetation that is designated for treatment within the SMZ would either be removed in the thinning operation or hand piled for burning (BMPs 1.19, 1.22, 1.6, and 1.8). Not burning hand piles or no treatment within the SMZ is permissible if fuels objectives are still attained.

- Prescribed burning would be conducted within Riparian Reserves and SMZ areas, but active ignition are prohibited within the SMZs. Burning may "back up" into the RRs and SMZs; however, fire would be suppressed if intensity is such that riparian vegetation or overstory canopy mortality would occur.

    - **Exception-** No ignition will be allowed 300 feet of the fish-bearing reaches of Benmore Creek and Bucknell Creek.

- On slopes <40%, no hand pile burning would occur within 25 feet of the channel high water line.

    - ***Exception*** – hand piles may be located within 10-25 feet of the channel high water line if there is a topographic break (flat or bench with slope <20%). During burning, fire would not be allowed to creep outside the perimeter of the piled material, and the downhill perimeter of burn piles would remain unlit in order to retain some slash for ground cover and to function as a sediment trap.

- On slopes 40-60%, no hand pile burning would occur within 25 feet of the high water line, and shall include the following requirements:

- Piling should utilize topographic features (flats, benches, or areas of least slope (10-20%), where available, to stabilize piles.

- Slash should be piled with stems oriented with the slope to prevent rollout.

- **Exception** – hand piles may be located within 10-25 feet of the channel high water line if there is a topographic break (flat or bench with slope <20%). During burning, fire would not be allowed to creep outside the perimeter of the piled material, and the downhill perimeter of burn piles would remain unlit in order to retain some slash for ground cover and to function as a sediment trap.

- On slopes >60%, slash may be lopped and scattered, and within the lower 10 feet of the SMZ the slash is to be moved upslope >10 feet from the channel high water line

Definitions:

Sawlogs: Trees 10 inches DBH or greater that produce a log 10 feet long with a 6 inch small end diameter

Mechanical Treatment: Ground based heavy equipment used to cut, masticate, pile remove, or transport woody material

Appendix C

Best Management Practices

The following Best Management Practices (BMP) will apply to the Pine Mountain Late-Successional Reserve Habitat Protection and Enhancement Project. A full description and definition of each listed BMP can be found in Appendix B of the hydrology report.

Timber Management Best Management Practices:

- 1.1 Timber Sale Planning Process
- 1.2 Timber Harvest Unit Design
- 1.3 Determination of Surface Erosion and Hazard for Timber Harvest Unit Design
- 1.4 Use of Sale Area Maps (SAM) and/or Project Maps for Designating Water Quality
- 1.5 Limited Operating Period of Timber Sale Activities
- 1.6 Protection of Unstable Areas
- 1.8, 1.19 Streamside Management Zone Designation & Streamcourse and Aquatic Protection
- 1.9 Determining Tractor Loggable Ground
- 1.10 Tractor Skidding Design
- 1.11 Suspended Log Yarding in Timber Harvesting
- 1.12, 1.16 Log Landing Location, Log Landing Erosion Protection and Control
- 1.13, 1.17 Erosion Prevention and Control Measures during Sale Operations, Erosion Control on Skid Trails
- 1.20 Erosion Control Structure Maintenance
- 1.21 Acceptance of Timber Sale Erosion-control Measures Before Sale Closure
- 1.22 Slash Treatment in Sensitive Area

Road Management Best Management Practices:

- 2.2 General Guidelines for the Location and Design of Roads
- 2.3 Road Construction and Reconstruction
- 2.4 Road Maintenance and Operations
- 2.5 Water Source Development and Utilization
- 2.7 Road Decommissioning
- 2.8 Stream Crossings
- 2.11 Equipment Refueling and Servicing

- 2.13 Erosion Control Plan

Vegetation Manipulation Best Management Practices:

- 5.2 Slope Limitations for Mechanical Equipment Operations
- 5.3 Tractor Operation Limitation in Wetlands and Meadows
- 5.6 Soil Moisture Limitations for Mechanical Equipment Operations

Fire Suppression and Fuels Management Best Management Practices:

- 6.2 Consideration of Water Quality in Formulating Fire Prescriptions
- 6.3 Protection of Water Quality from Prescribed Burning Effects

Watershed Management Best Management Practices:

- 7.4 Oil and Hazardous Substance Spill Contingency Plan and Spill Prevention Control and Countermeasures (SPCC) Plan
- 7.6 Water Quality Monitoring
- 7.8 Cumulative Watershed Effects